IN THE CLAIMS:

This Listing of Claims will replace all prior versions, and listings, of claims in the subject Patent Application:

Listing of Claims:

1-10. (Canceled).

11. (Currently Amended) An ~~non-periodic~~ echelle structure for use in an optical device comprising:

a grating surface disposed between input and output apertures, the grating surface including a plurality of contiguous reflective facet portions selectively disposed in a non-constant period arrangement to ~~achieve any arbitrary desired~~ define a predetermined narrow-band temporal optical transfer function H(v) between the ~~device's single-mode~~ input and output apertures, where v represents frequency in Hz and H(v) represents ~~is~~ a complex function having an amplitude A(v) and a phase Θ(v)~~, the transfer function being not achievable by means of a periodic echelle structure~~;

~~the non-periodic echelle structure comprising a plurality~~ respective facets of at least a pair of contiguous reflective facets~~,~~ portions being unequal~~ly~~ ~~spaced along any dimension~~ in spacing[[,]] and ~~of unequal~~ width dimensions.

12. (Currently Amended) An optical device for realizing an arbitrary narrow-band temporal optical transfer function; the device comprising:

entrance and exit apertures each operable to ~~which are~~ spatially single-mode filter an optical field incident thereon over a ~~the~~ prescribed wavelength range of operation;

an ~~non-periodic~~ echelle structure disposed between the entrance and exit apertures, the echelle structure having a grating surface including a plurality of contiguous reflective facet portions selectively disposed in a non-constant period arrangement, respective facets of at least a pair of contiguous reflective facet portions being unequal~~ly spaced along any dimension~~ in spacing[[,]] and ~~of an unequal~~ width dimensions; and

a means of collimating optical outputs of the single-mode entrance and exit apertures such that components of an ~~the~~ input beam, resulting from the collimation of the single-mode entrance aperture, is incident upon a ~~each~~ facet of the grating surface of the ~~non-periodic~~ echelle structure at a common angle of incidence, and components of an ~~the~~ output beam reflected by the grating surface toward~~, resulting from the collimation of~~ the single-mode exit aperture~~, is also incident upon each facet of the non-periodic echelle structure~~ being directed at a common angle relative to a ~~of incidence, input and output beams intersecting over an area encompassing all the reflective~~ facets of the grating surface ~~said non-periodic echelle structure~~.

13. (Currently Amended) A method of fabricating an ~~non-periodic~~ echelle structure having a grating surface including a plurality of reflective facet portions selectively disposed in a non-constant period arrangement, respective facets of at least a pair of reflective facet portions being unequal in spacing ~~along any dimension,~~ and ~~of an unequal~~ width dimensions, for use in an optical system having input and output apertures; the method comprising the steps of:

a) selecting ~~an appropriate~~ sampling interval of T seconds, where T is not longer than one-half the reciprocal of a frequency range, in Hz, over which a predetermined ~~desired~~ narrow-band temporal optical transfer function H(v) is ~~to be~~ uniquely specified, where v represents frequency in Hz and H(v) represents a complex function having an amplitude A(v) and a phase Θ(v);

b) selecting a number M of echelle facets to be illuminated by an input optical beam, based upon the chosen sampling interval T and a ~~the~~ minimum resolvable spectral feature W, in Hz, present in either the amplitude A(v) or the phase $\theta(\nu)$, where $M \geq \frac{1}{WT}$ rounded up to the nearest integer;

c) specifying a ~~the~~ frequency $\nu c$, in Hz, about which a characteristic curve for H(v) is approximately centered;

d) determining a ~~the~~ vector $\tilde{h}$ of complex impulse response coefficients, each defined by ~~the m'th coefficient,~~ $h_m = \int_{\nu c-\frac{1}{2T}}^{\nu c+\frac{1}{2T}} H(\nu) e^{j2\pi\nu m T} d\nu$, having an

amplitude $a_m$ and a phase $\varphi_m$, where $j=\sqrt{-1}$ is the imaginary unit, where m represents a counting index for the complex impulse response coefficients and $0 \le m \le M-1$;

e) normalizing the complex impulse response coefficient amplitudes, $a_m$ by multiplying each by a common factor K, such that $\sum_{m=0}^{M-1} K \cdot a_m = 1$;

f) starting at one edge of the input beam, x=0, selecting a ~~the~~ transverse width $w_0$ of a first illuminated facet, corresponding to m=0, such that the fraction of the input beam energy reflected by one said facet corresponds precisely to $Ka_0$, whereupon said facet is located in a ~~the~~ transverse position between x=0 and $x=w_0$

g) selecting a ~~the~~ transverse width $w_1$ of the next illuminated facet in the grating surface ~~array~~, corresponding to m=1, such that the fraction of the input beam ~~signal~~ energy reflected by said next illuminated facet corresponds precisely to $Ka_1$, whereupon said next illuminated facet is located in a ~~the~~ transverse position between $x=w_0$ and $x=w_0+w_1$;

h) iterating step g) M-2 times, to find respective ~~the~~ transverse widths and transverse positions for the remaining M-2 illuminated facets;

i) setting the precise longitudinal position, along the direction of propagation of the input beam, of the center of the $m^{th}$ ~~m'th~~ illuminated facet, such that a ~~the~~ relative delay, compared to a predetermined ~~any arbitrary~~ time reference,

experienced by an optical ray incident upon said <u>illuminated</u> facet and collected at the exit aperture is <u>defined by</u> $\Delta t_m = mT + \varphi_m/(2\pi\nu c)$.

14. (Currently Amended) The method of fabricating the ~~non-periodic~~ echelle structure recited in claim 13, ~~generalized to geometries other than collimated~~ <u>the</u> input and output beams <u>are collimated</u>.

15. (Currently Amended) The ~~non-periodic~~ echelle structure recited in claim 11 wherein said structure is replicated from a master.

16. (Currently Amended) The ~~non-periodic~~ echelle structure recited in claim 11 wherein each said facet being illuminated is coated for increased reflectivity.

17. (Previously Presented) The method recited in claim 14 wherein at least one of said entrance and exit apertures comprises a single-mode optical fiber.

18. (Currently Amended) The method recited in claim 14 further comprising the steps of confining said optical beam in at least one direction with a single mode slab waveguide and wherein said ~~non-periodic~~ echelle structure is formed in an edge of said slab waveguide.